



udent and teacher: Use this cover sheet for mailing or faxing.

# ASSIGNMENT BOOKLET 5A

MAT3038 Applied Mathematics 30  
Module 5: Activities 1 to 4 Assignment

## FOR STUDENT USE ONLY

Date Assignment Submitted:

\_\_\_\_\_

Time Spent on Assignment:

\_\_\_\_\_

(If label is missing or incorrect)

Student File Number:

\_\_\_\_\_

Module Number: \_\_\_\_\_

## FOR OFFICE USE ONLY

Assigned

Teacher: \_\_\_\_\_

Assignment

Grading: \_\_\_\_\_

Graded by: \_\_\_\_\_

Date Assignment Received:

## Student's Questions and Comments

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for  
correct course and module.

## Teacher's Comments

Teacher

## **INSTRUCTIONS FOR SUBMITTING THIS DISTANCE LEARNING ASSIGNMENT BOOKLET**

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- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

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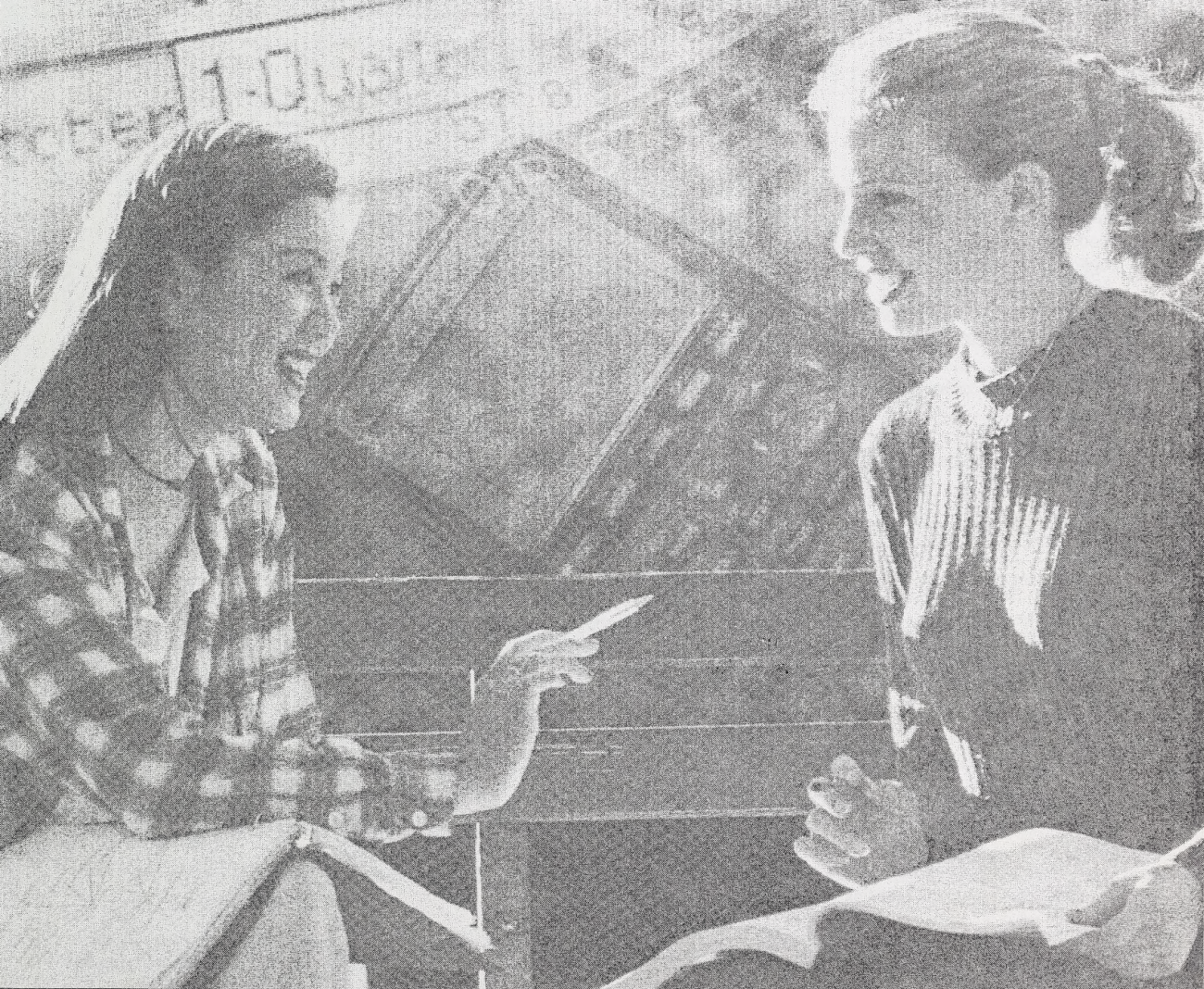
Module

5

# *Mathematics 30*

**SINUSOIDAL DATA**

**ASSIGNMENT BOOKLET 5A**



Learning  
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## FOR TEACHER'S USE ONLY

### Summary

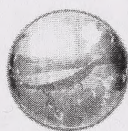
	Total Possible Marks	Your Mark
Activities 1 to 4 Assignment	75	

### Teacher's Comments

Applied Mathematics 30  
Module 5: Sinusoidal Data  
Assignment Booklet 5A  
Activities 1 to 4 Assignment  
Learning Technologies Branch  
ISBN 0-7741-2295-1

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Students	✓
Teachers	✓
Administrators	
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Other	



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- Learning Resources Centre, <http://www.lrc.learning.gov.ab.ca>

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**ASSIGNMENT BOOKLET 5A**  
**APPLIED MATHEMATICS 30: MODULE 5**  
**ACTIVITIES 1 TO 4 ASSIGNMENT**

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 75 marks out of the total 205 marks for the assignments in Module 5. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

75

**Activities 1 to 4 Assignment**

**Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.**

2

1. Refer to "Example 2: Ferris Wheel" on page 215 of the textbook. Name two earlier times at which the seat on the Ferris wheel is at the same height as at  $t = 60$  s.

---

---

2

2. Answer exercise 4 of "Discussing the Ideas" on page 216 of the textbook.

---

---

Return to page 18 of the Student Module Booklet and continue with Activity 1.

1

3. Turn to page 218 of the textbook and use the graph in exercise 6 of "Exercises: Checking Your Skills" to answer the following.

- a. For how many hours each day is a shadow cast?

---

1

- b. For how many hours each day is there no shadow?

---



①

- c. What is the minimum length of the shadow?

Return to page 20 of the Student Module Booklet and continue with Activity 1.

②

4. In “Investigation 1: What Is a Radian?” on pages 222 and 223 of the textbook, you found that  $2\pi$  radians fit into one complete revolution. Does the size of the circle affect how many radians fit into one complete revolution? Explain.

Return to page 22 of the Student Module Booklet and continue with Activity 2.

5. Suppose you have a 24-h clock (not a regular 12-h clock).

①

- a. How many radians does the hour hand pass through in 18 h?

②

- b. Is this more than one revolution? Explain.

Return to page 24 of the Student Module Booklet and continue with Activity 2.

6. Complete exercises 7 and 8 of “Investigation 1: Times of Sunrise” on page 226 of the textbook.

②

**Textbook exercise 7:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

③

**Textbook exercise 8:** \_\_\_\_\_

Return to page 30 of the Student Module Booklet and continue with Activity 3.

7. Complete exercises 6 and 7 of “Investigation 2: Determine the Frequency of a Musical Note” on page 227 of the textbook.

②

**Textbook exercise 6:** \_\_\_\_\_



②

**Textbook exercise 7:** \_\_\_\_\_

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Return to page 31 of the Student Module Booklet and continue with Activity 3.

8. Answer exercises 1 and 2 of “Discussing the Ideas” on page 229 of the textbook.

①

**Textbook exercise 1:** \_\_\_\_\_

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③

**Textbook exercise 2:** \_\_\_\_\_

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Return to page 32 of the Student Module Booklet and continue with Activity 3.

①

9. In “Example: Sine Regression and Tides” on pages 227 and 228 of the textbook, use the graph to determine the time when the tide is at a minimum. Round the time (in hours) to the nearest tenth.

---

Return to page 32 of the Student Module Booklet and continue with Activity 3.



10. Answer exercises 4 and 5 of “Getting Started” on page 83 of the Project Book.

⑥

**Project Book exercise 4:** (Round your answers to 2 decimal places.)

②

**Project Book exercise 5:** \_\_\_\_\_

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③

11. If you selected two other locations to study the tidal effect on life in the inter-tidal zone, describe how the data for these locations might differ from the data given for an area near Vancouver (page 83 of the Project Book). **Note:** If you have access to tide tables either on the Internet or at a library, check these tables to confirm your answer.

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Return to page 37 of the Student Module Booklet and continue with Activity 3.

②

12. In part b. of Example 1 on page 237 of the textbook, would the graph of  $y = 5 \sin 3x + 2$  be affected if you set the window of your calculator with  $Xscl = \frac{\pi}{3}$  instead of  $\frac{\pi}{6}$ ?

---

---

Return to page 41 of the Student Module Booklet and continue with Activity 4.

13. In Example 2 on page 238 of the textbook, use the graph to explain how each of the solutions of a. to d. was obtained.

②

a. 

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---

②

b. 

---

---

---

②

c. 

---

---

②

d. 

---

---

Return to page 42 of the Student Module Booklet and continue with Activity 4.



14. Answer exercises 1.c., 1.e., 2.b., 2.c., and 7 of “Exercises: Checking Your Skills” on pages 238 to 240 of the textbook.

①

**Textbook exercise 1.c.i.:**

①

**Textbook exercise 1.c.ii.:**

①

**Textbook exercise 1.c.iii.:**

①

**Textbook exercise 1.c.iv.:**

①

**Textbook exercise 1.c.v.:**

①

**Textbook exercise 1.c.vi.:**

①

**Textbook exercise 1.e.i.:**



① **Textbook exercise 1.e.ii.:**

① **Textbook exercise 1.e.iii.:**

① **Textbook exercise 1.e.iv.:**

① **Textbook exercise 1.e.v.:**

① **Textbook exercise 1.e.vi.:**



⑥

**Textbook exercise 2.b.:** (Determine the maximum and minimum values, amplitude, period, median value, and start point.)

⑥

**Textbook exercise 2.c.:** (Determine the maximum and minimum values, amplitude, period, median value, and start point.)

②

**Textbook exercise 7.a.:** \_\_\_\_\_

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②

**Textbook exercise 7.b.:** \_\_\_\_\_

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**Submit your completed Assignment Booklet 5A to your teacher for assessment.**  
Then return to page 42 of the Student Module Booklet and continue with Activity 4.



AL. 2, 2003-2004  
V. 5 booklet 8

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**ASSIGNMENT BOOKLET 5B**

MAT3038 Applied Mathematics 30

Module 5: Activity 5 Assignment, Module Review Assignment, and Module Project

FOR STUDENT USE ONLY		FOR OFFICE USE ONLY
Date Assignment Submitted: _____	(If label is missing or incorrect) Student File Number: _____  Module Number: _____	Assigned Teacher: _____  Assignment Grading: _____  Graded by: _____  Date Assignment Received: _____
<div><div>Student's Questions and Comments</div><div></div></div>		
<div>Apply Module Label Here</div> <div><div>Name _____ Address _____ Postal Code _____</div><div>Please verify that preprinted label is for correct course and module.</div></div>		
<div>Teacher's Comments</div> <div></div> <div>_____ Teacher</div>		

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2. All faxing costs are the responsibility of the sender.

## **E-MAILING**

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*Applied*

# *Mathematics 30*

Module

5

**SINUSOIDAL DATA**

**ASSIGNMENT BOOKLET 5B**



Learning  
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## FOR TEACHER'S USE ONLY

### Summary

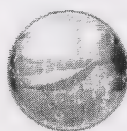
	Total Possible Marks	Your Mark
Activity 5 Assignment	40	
Module Review Assignment	50	
Module Project	40	
	130	

### Teacher's Comments

Applied Mathematics 30  
 Module 5: Sinusoidal Data  
 Assignment Booklet 5B  
 Activity 5 Assignment, Module Review Assignment, and Module Project  
 Learning Technologies Branch  
 ISBN 0-7741-2296-X

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Teachers	✓
Administrators	
Home Instructors	
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**ASSIGNMENT BOOKLET 5B**  
**APPLIED MATHEMATICS 30: MODULE 5**  
**ACTIVITY 5 ASSIGNMENT, MODULE REVIEW ASSIGNMENT,**  
**AND MODULE PROJECT**

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 130 marks out of the total 205 marks for the assignments in Module 5. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

40

### Activity 5 Assignment

**Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.**

2

1. Write the sinusoidal equation for the graph in Example 1 on page 241 of the textbook using the information provided in parts a. to d. of the solution. **Hint:** Calculate a value for  $b$  using the formula  $\text{Period} = \frac{2\pi}{b}$ . Round your value of  $b$  to the nearest hundredth.

---

2

2. Enter the equation from question 1 into your graphing calculator, and graph the equation. How does the graph on your calculator compare with the one on page 241?

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**Return to page 44 of the Student Module Booklet and continue with Activity 5.**

3

3. Use the equation in Example 2 on page 242 of the textbook to determine the daily mean temperature for January in Eureka. Round your answer to 1 decimal place.

---

**Return to page 44 of the Student Module Booklet and continue with Activity 5.**

- ③ 4. Use the equation from Example 2 on page 243 of the textbook to determine what day the angle of declination of the sun would be the greatest. Is your answer reasonable? Explain.

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Return to page 48 of the Student Module Booklet and continue with Activity 5.

5. Answer exercise 4 of “Exercises: Checking Your Skills” on page 246 of the textbook.

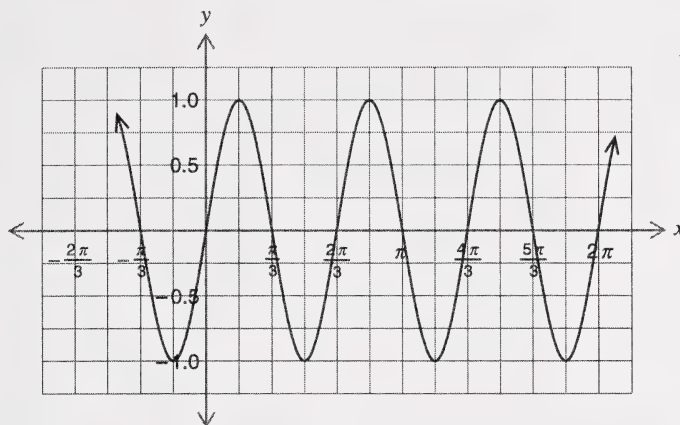
- ③ **Textbook exercise 4.a.:**

- ② **Textbook exercise 4.b.:**



①

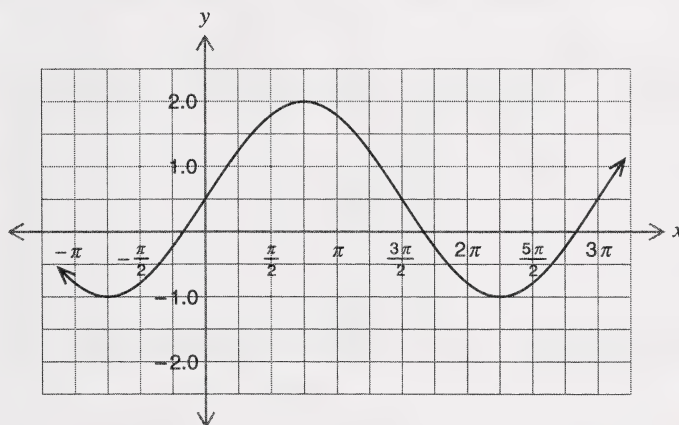
6. What is the period of the following graph?



7. For each graph, give the period, amplitude, and median.

③

a.




---



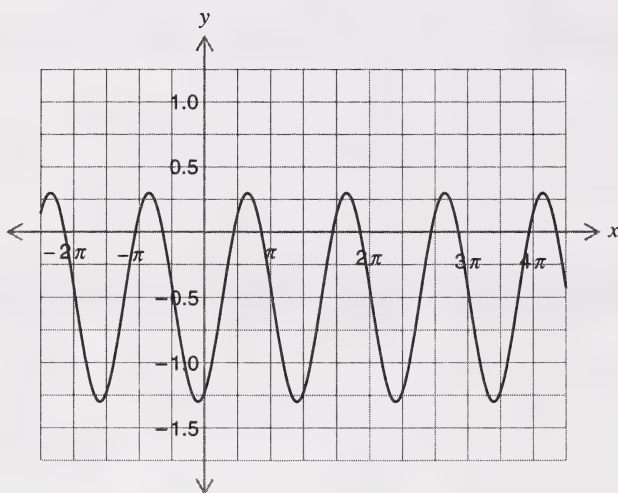
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③

b.




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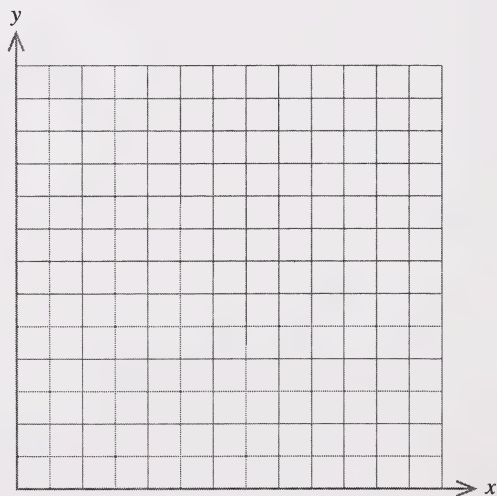
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8. For each data set, create a scatterplot and give an estimate of the period of the data.

②

a.

$x$	$y$
0.0	1.00
8.0	1.99
3.0	1.14
4.0	0.24
5.3	0.17
7.0	1.66
8.9	1.50
11.7	0.24
2.0	1.91
6.0	0.72



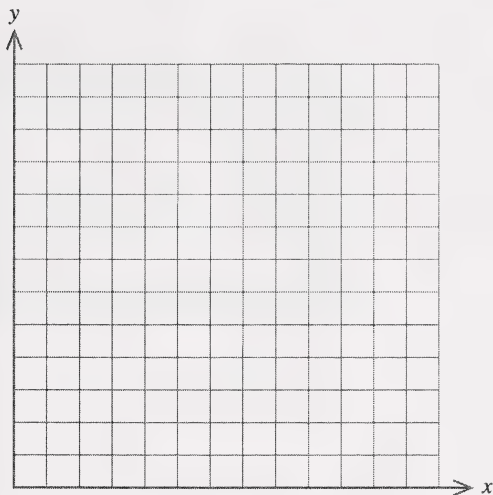

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②

b.

$x$	$y$
1.0	17.7
5.3	13.2
8.0	17.2
2.0	16.2
7.6	16.5
9.9	18.1
4.2	13.2
3.5	13.9



9. For each set of data in question 8, use your graphing calculator to determine an equation that could be used to predict values that have not been sampled. Fill in the blank displays given.

③

a.

Initial

Refined

```
SinReg
y=a*sin(bx+c)+d
a=
b=
c=
d=
```

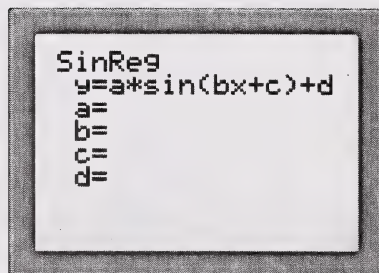
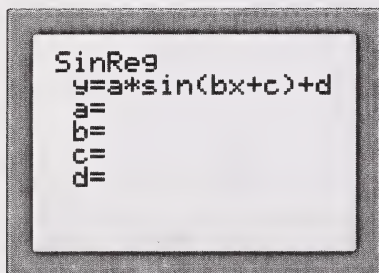
```
SinReg
y=a*sin(bx+c)+d
a=
b=
c=
d=
```

③

b.

Initial

Refined



10. Write a sinusoidal equation,  $y = a \sin(bx + c) + d$ , with the characteristics given.

③

a. amplitude = 2.5, period = 7.3, and minimum = -3

⑤

b. maximum = 5, period = 7, and start point (1.1, 4)



50

## Module Review Assignment

**Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.**

Answer questions 1 to 5 in this assignment on the answer sheet provided on page 18 of this Assignment Booklet. The answer sheet is similar to the one that will be used on the Diploma Examination for Applied Mathematics 30. Read the following information before proceeding.

### Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.
- Locate that question number on the separate answer sheet provided, and fill in the circle that corresponds to your choice.

#### Example

This assignment is for the subject of

- A. biology
- B. physics
- C. chemistry
- D. mathematics

Answer Sheet

(A) (B) (C) ●

### Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.
- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.
- Enter the first digit of your answer in the left-hand box. Any boxes on the right that are not needed are to remain blank.

## Examples

### Calculation Questions and Solutions

The value of  $\tan 35^\circ$ , to the nearest tenth, is \_\_\_\_\_.

(Record your answer in the numerical-response section on the answer sheet.)

Calculator value: 0.700 207 5

Value to be recorded: 0.7

Record 0.7 on the answer sheet. →

0	.	7	
---	---	---	--

●	○	○	○
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	●	7
8	8	8	8
9	9	9	9

A particular matrix operation produces the equation

$$2 \begin{bmatrix} 1 & 0.5 \\ 1.5 & 4 \end{bmatrix} = \begin{bmatrix} a & b \\ c & 8 \end{bmatrix}$$

In the equation above, the value of

$a$  is \_\_\_\_\_ (Record in the **first** column.)

$b$  is \_\_\_\_\_ (Record in the **second** column.)

$c$  is \_\_\_\_\_ (Record in the **third** column.)

(Record all **three digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 213

Record 213 on the answer sheet. →

2	1	3	
---	---	---	--

○	○		
0	0	0	0
1	1	1	1
●	2	2	2
3	3	●	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9



**Correct-Order Question and Solution**

Four different sets of data produce the following standard deviations.

- |          |     |          |     |
|----------|-----|----------|-----|
| <b>1</b> | 0.3 | <b>2</b> | 2.4 |
| <b>3</b> | 1.6 | <b>4</b> | 1.9 |

When these four standard deviations are arranged in order from **lowest** to **highest**, the order is \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 1342

Record 1342 on the answer sheet. →

1	3	4	2
•	•		
0	0	0	0
•	1	1	1
2	2	2	•
3	•	3	3
4	4	•	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Use the following information to answer question 1.

**A Set of Data**

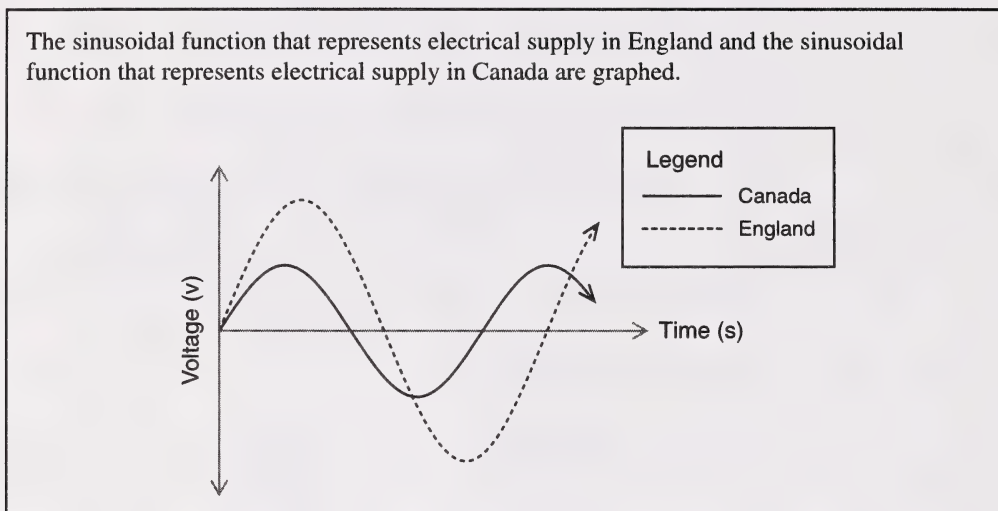
(1, -14)	(13, -15.5)
(3, 3)	(14, -3)
(4, 6)	(15, 17.5)
(5, 16.5)	(20, 27)
(7, 24)	(22, 9.5)
(10, 7.5)	(24, -9)

2

1. This data could most appropriately be modelled by a(n)

- A. linear regression
- B. quadratic regression
- C. sinusoidal regression
- D. exponential regression

Use the following information to answer question 2.



2. The sinusoidal function representing electrical supply in England differs from the sinusoidal function representing electrical supply in Canada in
- A. amplitude and period
  - B. period and horizontal shift
  - C. amplitude and vertical shift
  - D. horizontal shift and vertical shift

### Numerical Response

1. Enter the following data into your graphing calculator, and determine a sinusoidal regression equation.

$(35, 39.41), (140, 57.08), (332, 25.22), (506, 4.16), (593, 20.59)$

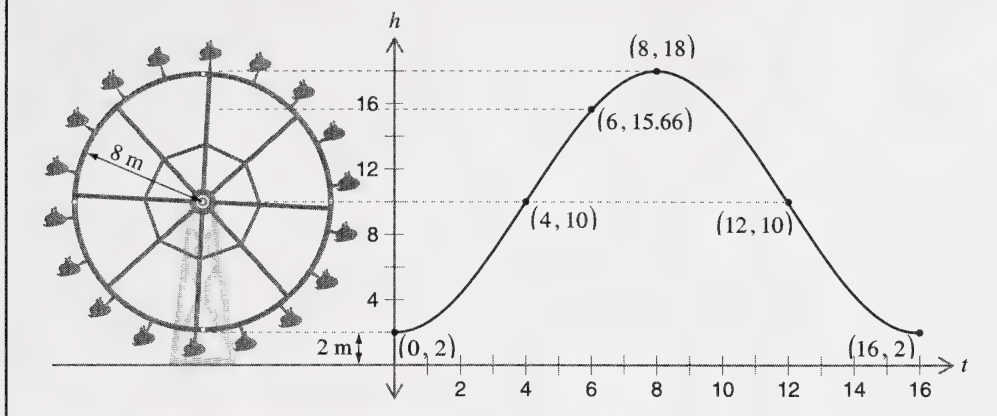
The value of  $a$ , to the nearest tenth, is \_\_\_\_\_.

(Record your answer in the numerical-response section on the answer sheet.)



Use the following information to answer questions 3 and 4.

The height,  $h$  (in metres), of a point on a Ferris wheel at time  $t$  (in seconds) can be represented by a sinusoidal function in the form  $h = a \sin(bt + c) + d$ .



2. 3. The function that **best** describes the height of a point on the Ferris wheel at any time is

A.  $h = 8 \sin(0.39t + 1.57) + 10$   
 B.  $h = 8 \sin(0.39t - 1.57) + 10$   
 C.  $h = 8 \sin(t + 4.02) + 10$   
 D.  $h = 8 \sin(t - 4.02) + 10$

2. 4. The amplitude of this sinusoidal function is

A. 10 m  
 B. 8 m  
 C. 4.02 m  
 D. 1.57 m

### Numerical Response

2. The minute hand on a clock has travelled through 35 min. How many radians, to the nearest hundredth, has the minute hand travelled? \_\_\_\_\_

(Record your answer in the numerical-response section on the answer sheet.)

2. 5. The height above ground of a chair on a different Ferris wheel follows the equation  $y = 5.7 \sin(0.31x) + 7.9$ , where  $y$  is the height (in metres) and  $x$  is the time (in seconds). A student wants to determine when the chair will be at a height of 13 m. The student could graph the sine function and look for the

- A.  $x$ -intercepts
- B.  $y$ -intercepts
- C. points where  $x = 13$
- D. points where  $y = 13$

6. Determine the amplitude, period, and start point for the following equations.

4. a.  $y = 3.8 \sin\left(\frac{2}{3}x - \pi\right) - 1.4$

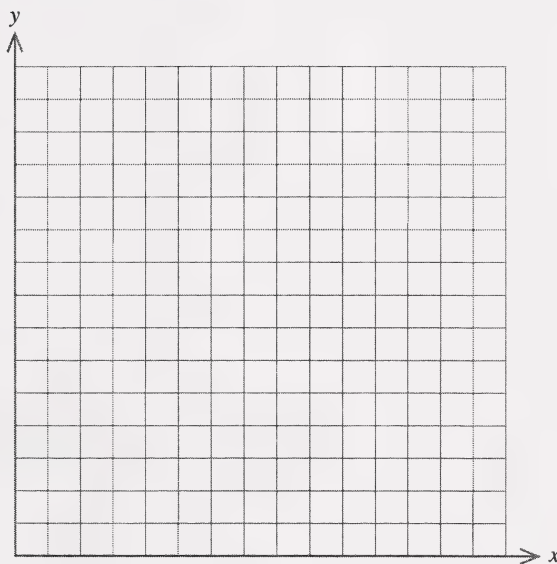
4. b.  $y = 73.8 \sin(5x + 2) - 31.4$

7. The following data shows the angle of elevation of the sun at a particular time of day for a community in Alberta on October 4, 2001.

Time	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
Angle of Elevation (degrees)	1	10	19	24	29	31	31	28	22	15	9	0

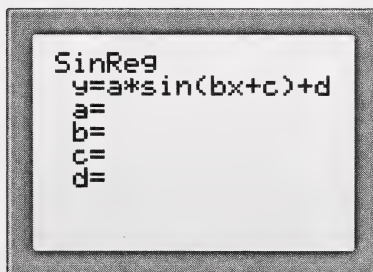
③

- a. Draw a scatterplot of the data.



③

- b. Find a sinusoidal regression equation for the data. Use an initial period of 24, and make sure you refine your equation.





2

- c. The following formula can be used to determine the latitude of this community:

$$\phi = \theta - \alpha + 90^\circ$$

In this formula,  $\phi$  is the latitude of the observer,  $\theta$  is the angle of declination of the sun that day, and  $\alpha$  is the maximum angle of elevation of the sun. **Note:** To determine the declination of the sun, refer to the table on page 243 of the textbook.

What is the approximate latitude of this community?

10

8. A seat at the top of a Ferris wheel is 15 m above ground. A seat at the bottom of the same Ferris wheel is 3 m above ground. The Ferris wheel completes a rotation every 75 s. At what height will these two seats be after 137 s?

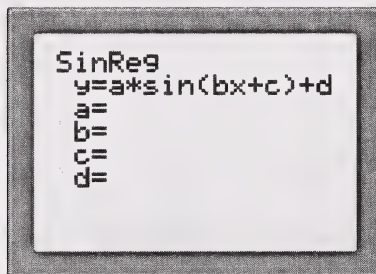


9. The following table shows the average monthly temperature (in °C) in Venice, Italy.

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2.4	4.1	7.7	12.3	17.0	20.7	23.3	22.6	19.2	13.7	7.8	3.6

4

- a. Find a regression equation for this data. Make sure you refine your equation.



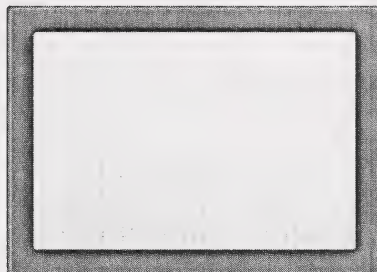
3

- b. If the growing season is the period where temperatures remain above 5°C, use the graph of your regression equation to estimate the growing season for Venice in 2001. Sketch your calculator display in the blank displays given.





- ② c. Use the graph of your regression equation to estimate the warmest day of the year, and give its likely temperature. Sketch what appears in your calculator display in the blank display given.



- ① d. How accurate do you expect the estimates in questions 9.a. and 9.b. to be?

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## Answer Sheet

1. (A) (B) (C) (D)

2. (A) (B) (C) (D)

3. (A) (B) (C) (D)

4. (A) (B) (C) (D)

5. (A) (B) (C) (D)

### Numerical Response

1.

	0	1		
0	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	
8	8	8	8	
9	9	9	9	

2.

	0	1		
0	0	0	0	
1	1	1	1	
2	2	2	2	
3	3	3	3	
4	4	4	4	
5	5	5	5	
6	6	6	6	
7	7	7	7	
8	8	8	8	
9	9	9	9	

Return to page 49 of the Student Module Booklet and continue with the Module Review.  
 If your teacher has indicated that the Module 5 project does not need to be completed,  
 submit Assignment Booklet 5B to your teacher for assessment.

40

## Module Project: Angle of Elevation of the Sun

Your teacher may not require you to complete all the projects in this Applied Mathematics 30 course. Contact your teacher and check whether you need to complete the module project, Angle of Elevation of the Sun, as part of your assessment.

If you are required to complete this project, **read all parts of the project carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.**

Your project for Module 5 is studying the angle of elevation of the sun. This project has three parts. First, you will have to collect data on the lengths of shadows that a metre-stick casts at different times throughout a day. Second, you will have to analyse the data that you gathered and find an equation that best describes the data. The final part is to use your findings to make predictions about sun events, like sunrise and sunset.

Your work in this project will be a final version of the work you did on the project throughout the Student Module Booklet.

8

1. Attach a copy of the table you created when performing exercises 1 to 7 of “Angle of Elevation of the Sun” on pages 200 and 221 of the textbook.



①

2. Describe how you kept the metre-stick vertical when measuring its shadow.

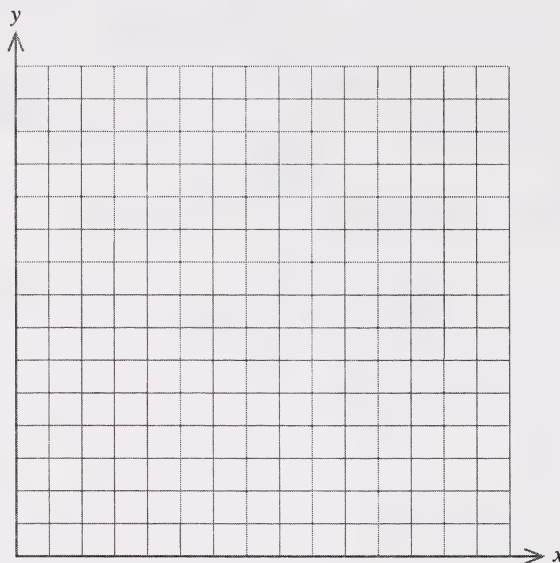
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④

3. Draw a scatterplot of the data in your table.



②

4. a. What is the approximate period of the data you collected?

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②

- b. What is the date on which you collected the data?

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②

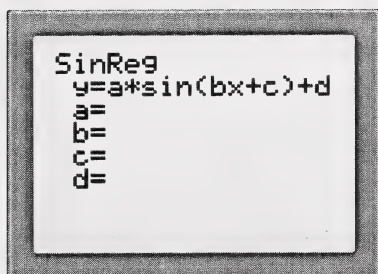
- c. What is your latitude? If you don't know, try this website:

**<http://www.heavens-above.com/countries.asp>**

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- ③ 5. a. Answer exercise 2 of “Regression and Prediction” on page 248 of the textbook. Be sure to enter the data for angle in radians. Use period = 24 hours to determine your initial regression equation.

**Refined Equation**



SinReg  
 $y=a*\sin(bx+c)+d$   
a=  
b=  
c=  
d=

**Graph**



- ③ b. Answer exercise 3 of “Regression and Prediction” on page 248 of the textbook. Draw what appears on your calculator display in the blank display given.



- ③ c. Answer exercise 4 of “Regression and Prediction” on page 248 of the textbook.

**Sunrise**



**Sunset**



- ③ 6. Answer exercise 6 of “Regression and Prediction” on page 249 of the textbook. **Note:** Don’t count your day of observation to determine the declination of the sun.

- ③ 7. Answer exercise 7 of “Regression and Prediction” on page 249 of the textbook.

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- ③ 8. Answer exercise 8 of “Regression and Prediction” on page 249 of the textbook.

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9. Answer exercise 9 of “Regression and Prediction” on page 249 of the textbook.









